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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/567,200	02/03/2006	Johannes J. Van Vaals	PHNL031008US	9601

38107 7590 11/14/2008
PHILIPS INTELLECTUAL PROPERTY & STANDARDS
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EXAMINER	
REARDON, ROCHELLE D	

ART UNIT	PAPER NUMBER
4185	

MAIL DATE	DELIVERY MODE
11/14/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 10/567,200	**Applicant(s)** VAN VAALS, JOHANNES J.	
	Examiner ROCHELLE REARDON	**Art Unit** 4185	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _03 February 2006_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-18_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-18_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _03 February 2006_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _2/03/2006_.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

.DETAILED ACTION

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 15-18 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claim 15-18 are directed to a computer program. As such, it is intended to be a manufacture. It is a Computer-Related Invention; however, it is unclear if the instructions to acquire an image of the target at its accurate geometrical position, as well as a second image of the fiducial markers at a shifted position relative to the first are necessarily in executable form. Thus, an argument could be made that claim 15 covers an embodiment of non-functional descriptive material.

Whether functional or non-functional, claims 15-18 fail to claim the program recorded on an appropriate computer readable medium so as to be structurally and functionally interrelated to the medium and permit the function of the descriptive material to be realized.

Since a computer program is merely a set of instructions capable of being executed by a computer, the computer program is treated as nonstatutory functional descriptive material. See MPEP 2106.01.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Kendrick et al. (US PG Pub 2003/0206614 A1)** in view of **Blumhofer et al. (US Patent 6,865,253).**

Regarding claim 1, Kendrick discloses a stereotactic frame attached to the patient that is helpful in substantially aligning the isocenter with a target tissue, such as a tumor, in a patient (Abstract, lines 2-5). A detailed three-dimensional image map is produced. Such images can be created from Computer Tomography, Magnetic Resonance Imaging, or from a variety of other sources. Fiducial markers that are placed within or upon the frame, appear in the images as reference points. These fiducial markers allow objects seen in the image to be related to the frame, and thus to be related to the patient's anatomy.

Once the tumor has been identified in the pre-procedural images, its location can be described using the coordinates of the frame (Paragraph 3, lines 6-15). As defined by the applicant, fiducial markers are either semi-permanently attached or marked on the patient (Specification, Page 5, lines 8-10). The procedures for alignment takes place while the patient is located on a moveable platform of the system and after the pre-procedural images of the patient have been generated (Paragraph 37, lines 1-5; Figure 5). Position data for the body frame is computed from the detector data and described in detector space. Once the marker positions are known in detector space, a transform from pre-procedural image space to detector space can be computed given the positions of the fiducial markers in the pre-procedural images and image pixel spacing. The target coordinates of the tumor are then extracted from the pre-procedural images, and utilizing the transform obtained, the target coordinates of the tumor in detector space are computed. Displacement values are then converted to parameters which are readily interpreted by a medical technician and displayed on a monitor (Paragraph 37, lines 10-23).

Kendrick fails to disclose a second image at a shifted position, and merging the accurate geometrical position of the target and fiducial marker into a single image.

However, Blumhofer et al. teaches the ability to accurately position a patient. The patient is placed on the table and initially pre-positioned in the treatment position as accurately as possible with respect to the linear accelerator (column 6, lines 29-33). The patient is then moved back out of the pre-

positioning using a defined offset, and into a recording position. The patient can then be shifted by guiding the table with the aid of co-ordinates and guiding the patient table with the aid of the tracking system and markers (column 6, lines 37-45; Figure 5). The spatial position of the image detector while the x-ray image of the actual position is being taken is determined (column 6, lines 53-54). The x-ray images and the reconstructed images are superimposed by marking and sliding over one another on a computer display by an operator.

5. It would have been obvious to one of ordinary skill in the art to modify the teachings of Kendrick with the ability to take images from multiple predefined positions, and superimposing these images onto one another. Doing so would provide a precise method for localizing a target.

Regarding claim 2, Kendrick discloses fiducial markers that are located on the bodyframe and appear as reference marks on the image set. The markers may be separate entities whose location is precisely known relative to the tracking markers; or the same physical markers can be used as both fiducial and tracking markers. The points where the fiducial markers are located define the bodyframe coordinate system and points on the patient's anatomy; since the frame is firmly attached to the patient. The bodyframe is placed on a moveable platform in view of the detector array. Tracking markers are sensed by the detector and their position is localized by the computer. The position of the tumor, defined in bodyframe space is combined with the marker position data to localize the tumor in detector space. By computing the displacement between the tumor location and pre-calibrated position of the isocentor, values

representing the misalignment between the two can be displayed for the technician (Paragraph 32, lines 1-30).

Kendrick fails to disclose obtaining an image wherein the anatomical target is located in close vicinity to said isocenter and the second image is obtained at a shift position with the fiducial markers close to the isocenter.

However, Blumhofer teaches the patient as being pre-positioned by means of a navigation and tracking system with computer and camera guidance, with the aid of artificial, in particular reflecting, arrangements of markers on the patient and on the devices for treatment (column 3, lines 11-15). The patient is placed on the patient table and initially pre-positioned in the treatment position as accurately as possible with respect to the linear accelerator (column 6, lines 29-33). The patient is then moved back out of the pre-positioning using a defined offset, and into a recording position (column 6, lines 36-39). This recording position lies outside the radiation range of the linear accelerator, and the shifting of the patient with respect to pre-positioning is stored (column 6, lines 47-49). The x-ray images and the reconstructed images are superimposed by marking and sliding over one another on a computer display by an operator. The images and the reconstructed images can also be superimposed by automatic, computer-guided image fusion (column 3, lines 33-38).

6. It would have been obvious to one of ordinary skill in the art to modify the teachings of Kendrick with the ability to obtain images of both the target and fiducial markers located at the isocenter. Doing so would provide the ability to

accurately locate the target with respect to the fiducial markers and the entire structure.

Regarding claim 3, Tracking markers are sensed by the detector and their position is localized by the computer. The position of the tumor, defined in bodyframe space is combined with the marker position data to localize the tumor in detector space. By computing the displacement between the tumor location and pre-calibrated position of the isocentor, values representing the misalignment between the two can be displayed for the technician. The technician then adjusts the movable platform so that the misalignment is minimized or eliminated (Paragraph 32, lines 21-32). Tracking software performs the processes necessary for tracking objects. An error software module computes the displacements between the target and isocenter and coverts this data to values most suitable for operator use (Paragraph 35, lines 43-48). The entire alignment can be automatic, and the computer system will determine if the alignment parameters are within tolerance (Paragraph 38, lines 3-15). Kendrick fails to disclose the use of determining the geometrical position of the target and fiducial markers by measuring the shift of the patient.

However, Blumhofer teaches an equation for positioning a patient for treatment as equaling the current position minus the offset II minus the offset I plus the positioning error compensation (column 8, lines 48-50). Offsets I and II are the positions recorded after shifting the patient away from the target as the isocenter. The device further includes an infrared tracking system with cameras for tracking passive markers (column 5, lines 25-28; Figures 3, 4 and 7).

7. It would be obvious to one of ordinary skill in the art to modify the teachings of Kendrick, with the ability to accurately measure the positions of the target and fiducial markers by measuring the shift in the patient position. Doing so would allow the target and fiducial marker locations to be reproduced accurately.

Regarding claim 4, Kendrick discloses the points where the fiducial markers are located define the bodyframe coordinate system and, hence, the points on the patient's anatomy, since the bodyframe is firmly attached to the patient. Features which appear in the pre-procedural CT/MRI image sets can be directly related to the bodyframe by exploiting the reference points, which correspond to the bodyframe fiducial markers, in the image (Paragraph 32, lines 9-16). The position of the tumor, defined in bodyframe space, is derived from the pre-procedural image data and combined with the marker position data to localize the tumor in detector space (Paragraph 32, lines 23-26). Kendrick fails to disclose merging the images together by overlapping corresponding parts in the images to a single image.

However, Blumhofer teaches x-ray images and reconstructed images that are superimposed by marking and sliding over one another on a computer display unity by the operation (column 3, lines 33-35). The x-ray and reconstructed images can be superimposed by natural structures or artificial structures such as markers (column 3, lines 22-31).

8. It would have been obvious to one of ordinary skill in the art to modify the teachings of Kendrick with the ability to overlap corresponding parts by merging

images. Doing so would provide the ability to reconstruct the target using multiple images.

Regarding claim 5, Kendrick discloses fiducial markers, placed within or upon the stereotactic frame that appear in the images as reference points. These fiducial markers allow objects seen in the image to be related to the stereotactic frame, and thus to be related to the patient's anatomy. Once the tumor has been identified in the pre-procedural images, its location can be described using the coordinates of the stereotactic frame (Paragraph 3, lines 6-15). The present invention overcomes the problems of the prior art by improving the positioning accuracy currently used by laser alignment systems. The prior art approaches have accuracies around 5-10 mm; while at least some embodiments of the invention have accuracies that are at least an order of magnitude better (Paragraph 11, lines 1-5). The detector array determines the position of the bodyframe in the detector space. The computer also receives a pre-procedural image data set of the body site of interest usually generated by some scanning technique such as CT or MRI (paragraph 31, lines 4-7). Once the data is localized its position can be compared with the previously calibrated position of the therapy machine isocenter and the displacements between the points can be displayed (Paragraph 31, lines 13-16).

Regarding claim 6, Kendrick discloses a bodyframe equipped with a plurality of tracking markers placed in a known geometry. A plurality of markers, which are shown as four as an example, are used to detect the location of the

bodyframe (Paragraph 33, lines 15-20; Figure 2a). Figure 2a shows the tracking markers placed left and right laterally on the patient.

Regarding claim 7, Kendrick discloses a bodyframe equipped with a plurality of tracking markers placed in a known geometry. A plurality of markers, which are shown as four as an example, are used to detect the location of the bodyframe (Paragraph 33, lines 15-20; Figure 2a). Figure 2a shows the tracking markers placed left and right laterally on both sides of the patient.

Regarding claim 8, Kendrick discloses a bodyframe equipped with a plurality of tracking markers placed in a known geometry. A plurality of markers, which are shown as four as only an example, are used to detect the location of the bodyframe (Paragraph 33, lines 15-20; Figure 2a). Figure 2a shows the tracking markers placed to the anterior and posterior on the patient. Kendrick fails to disclose markers at only the anterior or posterior.

However, Kendrick does teach that the plurality of markers represented on the semi-permanent bodyframe as shown with the use of four markers is by example only. He does not limit the placement of the markers (Paragraph 33, lines 15-20).

9. It would have been obvious to one of ordinary skill in the art to modify the teachings of Kendrick with placing the fiducial markers at either the posterior or anterior of the patient. Doing so would allow the use of fiducial markers which would be most beneficial in locating a particular target.

Regarding claim 9, Blumhofer discloses a patient that is pre-positioned as accurately as possible with respect to the linear accelerator/isocenter. At

least two images of the patient and/or one image in the vicinity of the target are produced from different recording angles on a single image recorder. The x-ray image is spatially localized, and at least on reconstructed image, corresponding to the image, especially isocentrically derived from a data set is produced. The reconstructed and x-ray images are superimposed, and then the position of the patient is corrected (Column 2, lines 24-40).

Regarding claim 10, Kendrick discloses Magnetic Resonance Imaging system which includes a stereotactic frame attached to the patient that is helpful in substantially aligning the isocenter with a target tissue, such as a tumor, in a patient (Abstract, lines 2-5). A detailed three-dimensional image map is produced. Fiducial markers that are placed within or upon the frame, appear in the images as reference points. These fiducial markers allow objects seen in the image to be related to the frame, and thus to be related to the patient's anatomy.

Once the tumor has been identified in the pre-procedural images, its location can be described using the coordinates of the frame (Paragraph 3, lines 6-15). As defined by the applicant, fiducial markers are either semi-permanently attached or marked on the patient (Specification, Page 5, lines 8-10). The procedures for alignment takes place while the patient is located on a moveable platform of the system and after the pre-procedural images of the patient have been generated (Paragraph 37, lines 1-5; Figure 5). Position data for the body frame is computed from the detector data and described in detector space. Once the marker positions are known in detector space, a transform from pre-procedural image space to detector space can be computed given the positions

of the fiducial markers in the pre-procedural images and image pixel spacing. The target coordinates of the tumor are then extracted from the pre-procedural images, and utilizing the transform obtained, the target coordinates of the tumor in detector space are computed. Displacement values are then converted to parameters which are readily interpreted by a medical technician and displayed on a monitor (Paragraph 37, lines 10-23).

Kendrick fails to disclose a second image at a shifted position, and merging the accurate geometrical position of the target and fiducial marker into a single image.

However, Blumhofer teaches a system which can accurately position a patient. The patient is placed on the table and initially pre-positioned in the treatment position as accurately as possible with respect to the linear accelerator (column 6, lines 29-33). The patient is then moved back out of the pre-positioning using a defined offset, and into a recording position. The patient can then be shifted by guiding the table with the aid of co-ordinates and guiding the patient table with the aid of the tracking system and markers (column 6, lines 37-45; Figure 5). The spatial position of the image detector while the x-ray image of the actual position is being taken is determined (column 6, lines 53-54). The x-ray images and the reconstructed images are superimposed by marking and sliding over one another on a computer display by an operator.

10. It would have been obvious to one of ordinary skill in the art to modify the teachings of Kendrick with a system that has the ability to take images from

multiple predefined positions, and superimposing these images onto one another. Doing so would provide a precise method for localizing a target.

Regarding claim 11, Blumhofer discloses a patient placed on the table and initially pre-positioned in the treatment position as accurately as possible with respect to the linear accelerator (column 6, lines 29-33). The patient is then moved back out of the pre-positioning using a defined offset, and into a recording position. The patient can then be shifted by guiding the table with the aid of co-ordinates and guiding the patient table with the aid of the tracking system and markers (column 6, lines 37-45; Figure 5). The spatial position of the image detector while the x-ray image of the actual position is being taken is determined (column 6, lines 53-54). The x-ray images and the reconstructed images are superimposed by marking and sliding over one another on a computer display by an operator. The images and the reconstructed images can also be superimposed by automatic, computer-guided image fusion (column 3, lines 33-38). In addition Blumhofer discloses image information and radiation target point information that are transferred to the position system, wherein it should optionally be possible to define a number of target points which are then processed sequentially (column 6, line 66 - column 7, line 3).

Regarding claim 12, Blumhofer discloses a moveable platform in which the patient is initially pre-positioned in the treatment position. The patient is then moved back out using a defined offset, and this position is recorded (column 6, lines 29-39; Fig. 5). The patient can be moved again to a recording position

(column 6, lines 63-67; Fig. 6). X-ray images are produced and recorded of the position (column 7, lines 1-4).

Regarding claim 13, Kendrick discloses Magnetic Resonance Imaging system which includes a stereotactic frame attached to the patient that is helpful in substantially aligning the isocenter with a target tissue, such as a tumor, in a patient (Abstract, lines 2-5). A detailed three-dimensional image map is produced. Fiducial markers that are placed within or upon the frame, appear in the images as reference points. These fiducial markers allow objects seen in the image to be related to the frame, and thus to be related to the patient's anatomy. The computer also receives a pre-procedural image data set of the body site of interest generated by a technique such as MRI. The images are used to precisely locate the target tissue inside the patient's body.

Once the tumor has been identified in the pre-procedural images, its location can be described using the coordinates of the frame (Paragraph 3, lines 6-15). As defined by the applicant, fiducial markers are either semi-permanently attached or marked on the patient (Specification, Page 5, lines 8-10). The procedures for alignment takes place while the patient is located on a moveable platform of the system and after the pre-procedural images of the patient have been generated (Paragraph 37, lines 1-5; Figure 5). Position data for the body frame is computed from the detector data and described in detector space. Once the marker positions are known in detector space, a transform from pre-procedural image space to detector space can be computed given the positions of the fiducial markers in the pre-procedural images and image pixel spacing.

The target coordinates of the tumor are then extracted from the pre-procedural images, and utilizing the transform obtained, the target coordinates of the tumor in detector space are computed. Displacement values are then converted to parameters which are readily interpreted by a medical technician and displayed on a monitor (Paragraph 37, lines 10-23).

Kendrick fails to disclose a second image at a shifted position, and merging the accurate geometrical position of the target and fiducial marker into a single image.

However, Blumhofer teaches a system which can accurately position a patient. The patient is placed on the table and initially pre-positioned in the treatment position as accurately as possible with respect to the linear accelerator (column 6, lines 29-33). The patient is then moved back out of the pre-positioning using a defined offset, and into a recording position. The patient can then be shifted by guiding the table with the aid of co-ordinates and guiding the patient table with the aid of the tracking system and markers (column 6, lines 37-45; Figure 5). The spatial position of the image detector while the x-ray image of the actual position is being taken is determined (column 6, lines 53-54). The x-ray images and the reconstructed images are superimposed by marking and sliding over one another on a computer display by an operator. In addition Blumhofer discloses image information and radiation target point information that are transferred to the position system, wherein it should optionally be possible to define a number of target points which are then processed sequentially (column 6, line 66 - column 7, line 3). The images and the reconstructed images can also

be superimposed by automatic, computer-guided image fusion (column 3, lines 33-38).

11. It would have been obvious to one of ordinary skill in the art to modify the teachings of Kendrick with merging the position of the fiducial markers and target using images taken at their accurate geometrical positions. Doing so would provide the ability for a workstation to receive the image data and use the data to locate the fiducial markers with respect to the target within the patient.

Regarding claim 14, Kendrick discloses Magnetic Resonance Imaging system which includes a stereotactic frame attached to the patient that is helpful in substantially aligning the isocenter with a target tissue, such as a tumor, in a patient (Abstract, lines 2-5). A detailed three-dimensional image map is produced. Fiducial markers that are placed within or upon the frame, appear in the images as reference points. These fiducial markers allow objects seen in the image to be related to the frame, and thus to be related to the patient's anatomy.

Once the tumor has been identified in the pre-procedural images, its location can be described using the coordinates of the frame (Paragraph 3, lines 6-15). The procedures for alignment takes place while the patient is located on a moveable platform of the system and after the pre-procedural images of the patient have been generated (Paragraph 37, lines 1-5; Figure 5). Once the marker positions are known in detector space, a transform from pre-procedural image space to detector space can be computed given the positions of the fiducial markers in the pre-procedural images and image pixel spacing. The target coordinates of the tumor are then extracted from the pre-procedural

images, and utilizing the transform obtained, the target coordinates of the tumor in detector space are computed. Displacement values are then converted to parameters which are readily interpreted by a medical technician and displayed on a monitor (Paragraph 37, lines 10-23).

Kendrick fails to disclose a second image at a shifted position relative to the first image.

However, Blumhofer teaches a system which can accurately position a patient. The patient is placed on the table and initially pre-positioned in the treatment position as accurately as possible with respect to the linear accelerator (column 6, lines 29-33). The patient is then moved back out of the pre-positioning using a defined offset, and into a recording position. The patient can then be shifted by guiding the table with the aid of co-ordinates and guiding the patient table with the aid of the tracking system and markers (column 6, lines 37-45; Figure 5). The spatial position of the image detector while the x-ray image of the actual position is being taken is determined (column 6, lines 53-54). The x-ray images and the reconstructed images are superimposed by marking and sliding over one another on a computer display by an operator.

12. It would have been obvious to one of ordinary skill in the art to modify the teachings of Kendrick with a system that has the ability to take images from multiple predefined positions, and superimposing these images onto one another. Doing so would provide a precise method for localizing a target.

Regarding claim 15, Kendrick discloses a computer system programmed with software modules to analyze the signals transmitted by the detector array to

determine the position of the bodyframe in the detector space. The computer also receives a pre-procedural image data set of the body site of interest generated by a technique such as MRI. The images are used to precisely locate the target tissue inside the patient's body. Once localized, its position can be compared with the previously calibrated position of the therapy machine isocenter and the displacement between the two points is displayed on the monitor connected to the computer (Paragraph 31, lines 1-18). Kendrick fails to disclose computer program controls in which a first image and second shifted image with respect to the first are acquired.

However, Blumhofer teaches a system which can accurately position a patient. The patient is placed on the table and initially pre-positioned in the treatment position as accurately as possible with respect to the linear accelerator (column 6, lines 29-33). The patient is then moved back out of the pre-positioning using a defined offset, and into a recording position. The patient can then be shifted by guiding the table with the aid of co-ordinates and guiding the patient table with the aid of the tracking system and markers (column 6, lines 37-45; Figure 5). The spatial position of the image detector while the x-ray image of the actual position is being taken is determined (column 6, lines 53-54).

13. It would have been obvious to one of ordinary skill in the art to modify the teachings of Kendrick, with the ability to acquire an image of the target at an accurate position, with a second acquired image at a shift position relative to the first using the fiducial markers. Doing so would provide computer based

instructions to prevent human error when locating a target relative to known markers.

Regarding claim 16, Kendrick discloses a computer system programmed with software modules to analyze the signals transmitted by the detector array to determine the position of the bodyframe in the detector space. The computer also receives a pre-procedural image data set of the body site of interest generated by a technique such as MRI. The images are used to precisely locate the target tissue inside the patient's body. Once localized, its position can be compared with the previously calibrated position of the therapy machine isocenter and the displacement between the two points is displayed on the monitor connected to the computer (Paragraph 31, lines 1-18). Kendrick fails to disclose computer program in which the position of the target and the position of the fiducial markers are merged into a single image.

However, Blumhofer teaches that the x-ray images and the reconstructed images are superimposed by marking and sliding over one another on a computer display by an operator. Blumhofer further teaches that the patient target is initially positioned at the linear accelerator/isocenter, and then an offset position is imaged using markers. These images are then superimposed together (column 6, lines 29-67).

14. It would have been obvious to one of ordinary skill in the art to modify the teachings of Kendrick with the ability to merge a first image of the target with a second image with respect to the fiducial markers. Doing so would provide the

ability for a computer system to manipulate the images to find the exact location of the target with respect to the fiducial markers, while minimizing human error.

Regarding claim 17, Kendrick discloses a computer system programmed with software modules to analyze the signals transmitted by the detector array to determine the position of the bodyframe in the detector space. The computer also receives a pre-procedural image data set of the body site of interest generated by a technique such as MRI. The images are used to precisely locate the target tissue inside the patient's body. Once localized, its position can be compared with the previously calibrated position of the therapy machine isocenter and the displacement between the two points is displayed on the monitor connected to the computer (Paragraph 31, lines 1-18). Kendrick fails to disclose computer program in which the position of the target and the position of the fiducial markers are merged into a single image.

However, Blumhofer discloses a moveable platform in which the patient is initially pre-positioned in the treatment position that is in line with the linear accelerator which is defined as the isocenter. The patient is then moved back out using a defined offset, and this position is recorded (column 6, lines 29-39; Fig. 5). The patient can be moved again to a recording position (column 6, lines 63-67; Fig. 6). Figures 5 and 6 are the production of x-ray images of the patient in which the markers and target can be located and in which the patient is in two different recording positions (column 5, lines 1-2).

15. It would have been obvious to one of ordinary skill in the art to modify the teachings of Kendrick with the ability to position the patient so that one position

has the target in the isocenter with the markers a predetermined distance, as well as shifting the patient so that the markers are close to the isocenter. Doing so would provide the ability for a computer system to manipulate the images to find the exact location of the target with respect to the fiducial markers.

Regarding claim 18, Kendrick discloses a computer system programmed with software modules to analyze the signals transmitted by the detector array to determine the position of the bodyframe in the detector space. The computer also receives a pre-procedural image data set of the body site of interest generated by a technique such as MRI. The images are used to precisely locate the target tissue inside the patient's body. Once localized, its position can be compared with the previously calibrated position of the therapy machine isocenter and the displacement between the two points is displayed on the monitor connected to the computer (Paragraph 31, lines 1-18). Kendrick fails to disclose computer program in which the position of the target and the position of the fiducial markers are merged into a single image.

Kendrick fails to disclose a second image at a shifted position, and merging the accurate geometrical position of the target and fiducial marker into a single image.

However, Blumhofer teaches a system which can accurately position a patient. The patient is placed on the table and initially pre-positioned in the treatment position as accurately as possible with respect to the linear accelerator (column 6, lines 29-33). The patient is then moved back out of the pre-positioning using a defined offset, and into a recording position. The patient can

then be shifted by guiding the table with the aid of co-ordinates and guiding the patient table with the aid of the tracking system and markers (column 6, lines 37-45; Figure 5). The spatial position of the image detector while the x-ray image of the actual position is being taken is determined (column 6, lines 53-54). The x-ray images and the reconstructed images are superimposed by marking and sliding over one another on a computer display by an operator. In addition Blumhofer discloses image information and radiation target point information that are transferred to the position system, wherein it should optionally be possible to define a number of target points which are then processed sequentially (column 6, line 66 - column 7, line 3). The images and the reconstructed images can also be superimposed by automatic, computer-guided image fusion (column 3, lines 33-38).

16. It would have been obvious to one of ordinary skill in the art to modify the teachings of Kendrick with merging the position of the fiducial markers and target using images taken at their accurate geometrical positions. Doing so would provide the ability for a computer to receive the image data and analyze the data to locate the fiducial markers with respect to the target within the patient without the aid of the user.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following references are cited for disclosing related limitations of the applicant's claimed and disclosed invention: **Cosman (US Patent 6,405,072), and Franck et al. (US PGPub 2003/0187351 A1).**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROCHELLE REARDON whose telephone number is (571)270-7104. The examiner can normally be reached on Monday thru Friday, 9:00 A.M. to 5:00 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terrell McKinnon can be reached on (571)272-4797. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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